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By-Roberts, Roy J.

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Prediction of College Performance of Superior Students

Roy J. Roberts

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Abstract

Using 857 male National Merit Finalists and Commended students, scales to predict first year college grades and science, writing, art, music, speech and leadership achievement were developed by analysis of 906 pre-college questionnaire items. Two item analysis strategies were used: (a) responses of achieving Ss and general samples of nonachieving Ss were compared; (b) responses of achieving and nonachieving Ss who had previously indicated desire to achieve were compared. The two strategies did not yield essentially different scales. Validity coefficients ranged from .15 to .38 with 300 cross-validation Ss; similar correlations resulted from applying the scales to 681 female Ss. More items about past accomplishment, activities, and competence entered the scales than did other item types, relative to the size of the item pools. The content of the scales and the correlations among variables support some unfavorable interpretations of high grade achievement. An hypothesis about the characteristics of achievers in the various areas was suggested.

Prediction of College Performance of Superior Students

Roy J. Roberts

This study follows a series of reports from the National Merit Scholarship Corporation (NMSC) on the prediction of college performance (Holland, 1958a, 1959, 1960, 1961; Holland & Astin, 1962; Holland & Nichols, 1964; Nichols & Holland, 1963). In these studies, predictor data were gathered on high school students of very high scholastic aptitude, usually National Merit Finalists, and the college performance of these students was later surveyed. With aptitude controlled, nonintellective predictors can emerge. Not only is the nature of measures which differentiate high aptitude achievers from high aptitude nonachievers theoretically interesting, but differentiation among superior students is a practical problem at NMSC and at many selective colleges.

The previous studies used standard published inventories, experimental inventories, and some a priori scales constructed at NMSC. The one item analysis performed (Holland & Nichols, 1964) used criteria of high school extracurricular achievement in the development of "achievement potential" scales which were then used to predict college achievement. Cross-validation correlation coefficients for these scales ranged as high as .64, and averaged .37. These results, in the context of the general findings of NMSC research, led Astin (1964) to suggest more use of empirical keying.

In the present study, a large number of nonintellective items were empirically screened, and formed into predictor scales. All subjects were high aptitude students. The predictor data were collected prior to college entrance, and the criterion data--grades, and science, writing, art, music, speech, and leadership achievement--were collected after one year of college.

A conventional item analysis method was used: for each criterion, achievers were contrasted with a sample of nonachievers. But while it may be reasonable to assume that all students should work at achieving grades, making a general sample of low grade achievers suitable for item analysis, the other criteria are of a different nature. Only some students are, or should be, interested in achieving in a given area. By definition, those who do achieve have the necessary interest or commitment. If they are contrasted with a sample of nonachievers containing many students with no intention of working in the area, as is the case with the conventional item analysis method, items tapping interests should emerge strongly. Especially if the students are all high in the important variable of scholastic aptitude, noninterest items which tap some essential quality might be overlooked.

A second item analysis strategy was used: a search for items which differentiate achievers and nonachievers from among those who are trying to achieve. For each area of achievement, except grades, those students whose precollege responses showed some interest or commitment to activities or achievement in that area were selected, and the predictor item responses of achievers and nonachievers from this "committed" group were compared.

Method

Subjects

The subjects were Semifinalists or recipients of Letters of Commendation in the 1962 National Merit Scholarship program, which means that they scored above the 96th percentile on national norms on the National Merit Scholarship Qualifying Test. About 2400 students were mailed questionnaires prior to college entrance, and 1988, or 83%, returned them. These 1988 received the second questionnaire one year later, and 1838 returned it. The

1838 used in this study are approximately 77% of those originally contacted. There are 1157 males, and 681 females. All but 62 attended one of 32 colleges and universities selected to represent a diversity of institutional types.

Criteria of Achievement

The postfreshman-year questionnaire included checklists of achievement and a 10-point scale for reporting first year grade average: A, A-, B+, B, B-, C+, C, C-, D+, D or lower. In a study using a similar sample and item, the correlation between self-reports and grades obtained from transcripts for 157 subjects was .96 (Nichols & Holland, 1963).

Table 1 shows the areas of achievement defined as criteria, and the items used. Each criterion was dichotomized: achievement versus nonachievement for the nonacademic areas, and high (A or A-) versus low (C+ or lower) for grades.

Predictor Items

The predictor items came from the precollege questionnaire.

Responses to the following items were "like" or "dislike." "Like" responses were tabulated in item analysis.

1. 160 occupational titles--These items comprise the Vocational Preference Inventory (Holland, 1958b).

2. 23 school subjects.

3. 48 sports and games.

Responses to the following items were "frequently," "occasionally," or blank. "Frequently" responses were tabulated in item analysis.

4. 200 activities--Illustrative items: Building scientific equipment; Camping; Reading historical novels; Daydreaming.

5. 76 places to be visited--Illustrative items: A professional stage play; A National Park; An operating room; A fashion show.

The following items were checklists; the subjects responded to those which applied.

6. 39 things which might be found in the home--Illustrative items: Power tools; A collection of classical records; A typewriter; Chemical laboratory equipment.

7. 82 accomplishments--These items survey, rather comprehensively, achievement in science, the arts, leadership, etc.

8. 34 attempted accomplishments--Respondents indicated the activities they had tried, not necessarily finished or accomplished.

9. 143 competencies--Illustrative items: I can be a good hostess (host); I can design stage sets; I can read Latin; I can drive a truck.

The following items have miscellaneous response formats.

10. 29 traits and abilities--Respondents rated themselves on a 4-point scale. Responses at the upper point, "top ten per cent," were tabulated.

11. 35 life goals--On a 4-point scale, respondents indicated the importance of these aspirations. Responses were dichotomized, tabulating "essential" and "very important"; "somewhat important" and "little importance" were the low responses. Illustrative items: Becoming happy and content; Making a technical contribution to science; Being well read; Being a good parent.

12. 18 intentions--Respondents indicated their intention to attempt each accomplishment "in college," "after college," or "not at all." The three alternatives were tabulated as separate items. Illustrative items: Join several organizations; Obtain a research grant; Compose music. The items parallel the criterion items in the second questionnaire.

13. 19 time diary items--Respondents wrote in the hours spent on each of 19 classes of activity during "an average week" of the past school year. The responses were dichotomized as near the median as possible, and high responses were tabulated. Illustrative items: Studying for school assignments; Daydreaming; Participating in musical, dramatic, or artistic activities.

Procedure

A computer program (Nichols & Tetzlaff, 1965) tabulated the responses of upper and lower criterion groups and calculated a phi coefficient for each item. These analyses were done only with the male subjects, since there were not enough female achievers for both item analysis and cross-validation. The item analysis used 857 males; 300 were left for cross-validation. (With the self-ratings, time diary, and life goals a blank item was not meaningful, so students with missing data, including some achievers, were not used in the analysis of these items.)

For most areas of achievement the number of achievers was relatively small (see Table 1), and 150 was a sufficient number for nonachieving groups for item analysis. These groups were selected by reference to the final digits of the student identification numbers, where there was no systematic bias, in such a way that they did not contain the same subjects in each analysis. The numbers selected proved to be quite close to 150: the smallest was 137 and the largest was 164.

Separate item analyses were performed with a "commitment" strategy. Alternate definitions of commitment were tried. For each area of achievement, the most stringent definition counted as committed those subjects who responded "in college" to relevant questions about their plans (items labelled "intentions" above). A second definition also included as committed those

who responded "after college." In some areas a third definition added still more: those who rated a relevant life goal as "essential" or "very important." A tally of the data showed, for each area, the number of people considered committed with each definition, and the number of them who achieved. For each area a definition was selected for further use; the basis of selection was the minimization of the percentage of people considered uncommitted who achieved.

For one area, Art, a large proportion of those who achieved were considered uncommitted by all definitions, and this area was dropped from this phase of the study. For the other areas, the definitions used are shown in Table 4. Item analyses were done with achievers and nonachievers from among the committed subjects.

Items with phi coefficients significant at the .05 level were collected into scales, scored with one point for each response in the keyed direction. The correlations among all variables, the criteria and the scales, were computed separately for the item analysis subjects, the cross-validation subjects, and the females. The scale intercorrelations and correlations of scales with grades are product-moment; other criterion-scale correlations and the correlations of grades with other criteria are point biserial; and the rest of the criterion intercorrelations are phi coefficients.

Results

Table 1 presents the numbers of achievers in each area. The column headed "item analysis" shows the size of the upper criterion groups for item analysis. (The lower criterion groups numbered about 150.) The rate of achievement for all the nonacademic areas, except leadership, is not large. Since the superior students in this study probably have a higher than average

rate for these achievements, the criteria defined seem to represent unusual and high level accomplishment during the freshman year.

Table 1

Number of Achievers and Items Defining Achievement

Area of Achievement	Items[a]	Males		Females
		Total (N=1157)	Item Analysis (N=857)	Total (N=681)
Grades[b]	A or A- grades	---	170	---
Science	Received a research grant Gave an original paper at a scientific or professional meeting sponsored by a professional society or association[c] Had a scientific or scholarly paper published (or in press) in a scientific or professional journal[c] Invented a patentable device	25	19	9
Writing	Had poems, stories, essays, or articles published in a public newspaper, magazine, anthology, etc. (not college publication) Wrote one or more plays (including radio or TV plays) which were given public performance Had poems, stories, essays, or articles published in a college publication Won literary award or prize for creative writing	96	71	67
Art	Won a prize or award in an art competition (painting, sculpture, ceramics, etc.) Had photographs, drawings, or other art work exhibited or published	42	28	30
Music	Performed as a soloist on radio or TV program Played in a professional jazz ensemble or dance band Won prize or award in musical competition as performer			

Table 1 (cont)

Achievement	Items	Males Total	Males Item Analysis	Females Total
Music (cont)	Composed music which has been given at least one public performance Arranged music for public performance Had one or more musical publications Performed with a professional orchestra Gave a public recital (not collegiate) Directed (publicly) a choir	60	48	37
Speech	Placed 2nd, 3rd, or 4th in a debate contest Won one or more speech or debate contests	23	16	7
Leadership	Nominated for one or more student offices [d] Elected to one or more student offices	261	186	215

[a] Students who checked any of the listed items were identified as achievers for that area.

[b] This entry is the number of people in the upper criterion group for item analysis. The lower group, those reporting C+ or lower, numbered 253.

[c] These items were edited to remove students who prepared papers in a scholarly but nonscientific area.

[d] This item was edited to remove all students except those nominated to an office judged to be major, or more than one minor office.

In Table 2 are shown the intercorrelations among the criteria. Although

Table 2

Intercorrelations of the Criteria

(Males below the diagonal, N=857; Females above the diagonal, N=681)

Criterion	1	2	3	4	5	6	7
1. First year college grades[a]		03	04	-06	00	01	02
2. Science achievement	13		-04	-02	-03	-01	-02
3. Writing achievement	-01	04		07	07	06	04
4. Art achievement	-01	-03	09		-02	-02	05
5. Music achievement	-04	-04	04	07		17	02
6. Speech achievement	-02	-02	02	02	04		-01
7. Leadership achievement	02	00	04	05	04	01	

[a] Correlations with grades were computed with N=845 for boys and N=668 for girls, since one college in the sample did not give grades to freshmen.

the larger correlations are statistically significant, the practical significance of Table 2 is that the criteria are relatively independent. The correlation between grades and scientific achievement may be an exception.

Table 3 presents, separately for the cross-validation, item analysis, and female subjects, the correlations of the "conventionally developed" scales with all criteria. The correlations of the criteria with their appropriate scales are on the main diagonal of each matrix. The scales, developed entirely on males, generalized to a sample of females about as well as they held up with cross-validation on another male sample.

Table 3

Criterion-Scale Correlations

	Scales						
Criteria	Grades	Science	Writing	Art	Music	Speech	Leadership
Item Analysis Ss (N=857)							
Grades	37	08	-08	-10	02	-01	-10
Science	09	35	00	01	-01	00	00
Writing	-07	08	39	16	07	27	18
Art	-03	06	05	40	03	12	04
Music	05	02	04	07	43	00	01
Speech	03	04	09	05	01	32	06
Leadership	-09	05	17	06	05	15	34
Cross-validation Ss (N=300)							
Grades	20	02	00	-07	-03	03	-01
Science	05	23	-03	09	02	-01	-01
Writing	06	04	15	07	07	21	06
Art	05	15	03	18	02	05	04
Music	01	05	07	08	38	-01	02
Speech	-03	01	19	-03	03	27	15
Leadership	-01	12	12	10	08	14	15
Female Ss (N=681)							
Grades	18	01	-06	-13	-06	-02	-05
Science	07	10	-09	02	-02	-04	-04
Writing	00	05	23	14	05	19	11
Art	01	09	06	24	00	10	03
Music	-05	-03	15	07	28	12	12
Speech	00	11	05	07	-01	12	08
Leadership	-08	05	10	09	06	04	17

Table 4

Numbers of Committed and Achieving Committed Students and Items Defining Commitment[a]

Area	Items[b]	Response	Committed	Committed Achievers
Science	Obtain a research grant	In or after college	813	22
	Patent an invention	In or after college		
	Making a technical contribution to science	Essential or very important		
	Making a theoretical contribution to science	Essential or very important		
Writing	Submit poems, stories, essays, or articles for publication	In or after college	615	80
	Write one or more plays (including radio or TV plays)	In or after college		
	Compete for a literary award or prize in creative writing	In or after college		
Music	Perform as a soloist (voice or instrumental)	In or after college	317	48
	Compose music	In or after college		
	Perform with a jazz or dance band	In or after college		
	Perform with a professional concert orchestra	In or after college		
	Becoming an accomplished musician (performer or composer)	Essential or very important		
Speech	Participate in a speech or debate contest	In college	407	17
Leadership	Run for elective office	In or after college	624	182

[a] Based on the total male sample, N=1157.

[b] Students who responded as shown to any listed item were identified as committed in that area.

Table 4 (page 10) shows the number of students identified as committed to activity in each achievement area, and the number of them who achieved. A comparison of Tables 1 and 4 shows that the achievers who were classified as committed are a large proportion of the total achievers. The items used for commitment selection (shown in Table 4) are evidently good predictors of achievement.

The correlations between the scales derived from item analyses within the committed subgroups and the conventionally developed scales are shown in Table 5. The item overlap between the paired scales was great, and the high

Table 5

Correlations between Conventional Scales and "Commitment" Scales

	Males (N=300)	Females (N=681)
Achievement area	r	r
Science	.89	.79
Writing	.96	.95
Music	.70	.66
Speech	.63	.64
Leadership	.88	.84

correlations of Table 5 demonstrate the similarity of the scales. But the commitment scales do have some variance unshared with the conventional scales. If this variance is highly related to the criteria, the commitment scales could be superior predictors.

Table 6 presents the correlations between the commitment scales and the appropriate criteria. These validity coefficients are very similar to those in Table 3, indicating a failure for the strategy of taking commitment into account. If there are any differences, they seem to favor the conventional scales.

Table 6

Correlations of the Criteria with the Appropriate "Commitment" Scales

Criterion	Item Analysis (N=857)	Cross Validation (N=300)	Females (N=681)
1. Science achievement	.37	.21	.04
2. Writing achievement	.39	.16	.24
3. Music achievement	.48	.38	.20
4. Speech achievement	.34	.11	.07
5. Leadership achievement	.32	.14	.12

In Table 6 the commitment scales were applied in the same manner as the conventional scales. Table 7 extends the commitment strategy to the application of the scales. Achievement was predicted for the subjects with the highest scores on each conventional scale; the number of subjects thus selected was determined by the rate of achievement in the item analysis sample. The actual achievement of these subjects is shown in Table 7. With the commitment scales, nonachievement was automatically predicted for "uncommitted"

Table 7

Actual Achievement of the Highest Scale Scorers in the Cross Validation Sample

	Highest Scorers on Conventional Scales[a]		Highest Committed Scorers on "Commitment" Scales[b]	
Achievement area	Achievers	Non-achievers	Achievers	Non-achievers
Science	2	6	2	5
Writing	6	20	5	20
Music	6	10	6	10
Speech	3	3	0	7
Leadership	27	44	24	47

[a] For each achievement area, the number of top scorers selected was determined by the rate of achievement in the item analysis sample.

[b] "Uncommitted" subjects were automatically excluded.

subjects, whatever their commitment scale scores: all of the highest scoring subjects whose achievement is shown in the last two columns of Table 7 are committed. (Small differences in the total number of subjects for whom achievement was predicted by the two methods are due to tie scores on the scales.) The numbers of subjects are small, but the conclusion is based upon five separate comparisons: in no case did taking commitment into account improve prediction.

The conventional scales are the subject of the rest of this report. Their intercorrelations are shown in Table 8. These relationships are much higher than the criterion intercorrelations. Item overlap can account for only a small part of the size of the positive correlations. For example,

Table 8

Intercorrelations of the Scales

(Males below the Diagonal, N=300; Females above the Diagonal, N=681)

Criterion	1	2	3	4	5	6	7
1. First year college grades		19	-51	-34	-14	30	-65
2. Science achievement	31		04	43	04	20	16
3. Writing achievement	-48	-03		55	40	76	76
4. Art achievement	-2	49	43		30	53	50
5. Music achievement	-06	19	41	39		21	33
6. Speech achievement	-20	18	74	39	23		64
7. Leadership achievement	-64	07	80	44	28	67	

the speech and art scales shared 14 items; the writing and leadership scales shared 28 items; and the science and music scales shared 7 items, with 3 of them keyed in opposite directions.

Grades Scale

This scale included 222 items, with 182 keyed negatively. The largest cluster of positive predictors relates to scientific and mathematical interests and abilities. High achievers also were more likely to have had musical interests and experience. One positive item concerned placing in a speech

or debate contest. The remaining interpretable positive predictors were items, such as self-rating on scholarship, with content rather obviously related to grades.

Negative predictor groupings are: (a) interest and participation in sports, games, and outdoor activities; (b) social activity and interpersonal competence; (c) entertainment (e.g., TV watching); (d) "practical" abilities (e.g., shingle a roof, adjust a carburetor); (e) interest in leadership positions; (f) many occupations, especially those relating to business, mechanical qualities, "adventurous" qualities, the law, and counseling or helping activities; (g) a heterogeneous list of activities and accomplishments.

Science Scale

This scale included 80 items, with 15 keyed negatively. There are more items with very low frequencies of endorsement than in the other scales. More than half of the positive predictors are direct indicators of scientific activity or interest, and several others may be "technological" in nature (e.g., photography, nature collections). The remaining positive predictors do not form readily interpretable groupings.

Among the negative predictors are several life goals relating to comfort, happiness, and contentment, and to finding a purpose in life. Two negative items concerning social activity may be noteworthy: fewer science achievers reported frequent party attendance and social dancing.

Writing Scale

This scale included 167 items, with 20 keyed negatively. About one-third of the positive predictors concern writing ability or interest, publishing activities, reading and books, etc. Drama and entertainment, speech and art are represented. The remaining groupings of positive predictors are:

(a) leadership and politics; (b) competence and interest in interpersonal relations (e.g., interest in social worker, baby sitting activity, entertaining older people); (c) games (e.g., charades, chess); (d) interest in history; (e) diverse experiences, activities, and competencies.

The negative predictors indicate a lack of scientific or technological interest among writing achievers.

Art Scale

This scale included 97 items, with six keyed negatively. Nearly half the positive predictors concern interest or ability in art, design, and photography. The remaining positive predictor groupings are: (a) activity and interest in writing and publication; (b) science; (c) entertainment (e.g., interest in television producer, dramatic interpretations); (d) a few "practical" abilities and activities (e.g., work own business, drive a truck, iron clothes).

The negative predictors may indicate a lack of interest in organized sports.

Music Scale

This scale included 129 items, with 17 keyed negatively. Well over half of the positive predictors are directly concerned with musical interest and ability. Art, writing, drama, and speech account for several items. Travel, sightseeing, and a number of places visited are positive predictors, as are ability at entertaining and being a host.

Although belonging to an honorary scientific society was a positive predictor, several negative predictors seem to indicate a lack of commitment to science. There is also a suggestion of a lack of interest in sports.

Speech Scale

This scale included 72 items, with 15 keyed negatively. Nine positive predictors refer directly to ability or experience in speech. Other groupings

of positive predictors are: (a) literature, drama, books, and work on publications; (b) art and design; (c) politics, leadership, organizations, and interest in history. The remaining positive predictors are not readily interpretable.

Among the negative predictors was dating.

Leadership Scale

This scale included 135 items, with five keyed negatively. Thirty-four items refer directly to leadership aspiration and experience, organizations, and politics. Other groupings are: (a) writing; (b) speaking; (c) socializing (e.g., dating, high popularity self-rating); (d) legal occupations; (e) science, especially zoology and physiology. A large number of items are not grouped; they seem to indicate a wider range of activity, experience, and interest for leadership achievers.

The items composing each scale are classified by type in Table 9. For each scale, the numbers of items of each type are given, and these numbers are converted to percentages of the total number of items of that type in the item pool. One type listed in the description of the predictor item pool earlier in this report is omitted from Table 9: "Intentions." These items had three response alternatives, which could enter the scales as separate items, and it is not legitimate to compare quantitatively the representation on the scales of these items with that of the other items. A large number of the intention items did enter the scales, which is not surprising, since many of the criterion items are almost parallels of these intentions.

The next to last column in Table 9 shows the averages of the percentages of each item type, which are intended as indices of the efficiency of each item type. The last column presents the average percentages with the grades scale omitted from the calculations, probably a legitimate omission since

Table 9

The Composition of the Scales

Item Types	Scales																Mean %	Mean % Grades Excluded
	Grades		Science		Writing		Art		Music		Speech		Leadership					
	No.	% of Pool	No.	% of Pool	No.	% of Pool	No.	% of Pool	No.	% of Pool	No.	% of Pool	No.	% of Pool				
Occupations	71	44.4	3	1.9	34	21.2	11	6.9	12	7.5	5	3.1	25	15.6			14.4	9.4
Activities	29	14.5	24	12.0	44	22.0	22	11.0	30	15.0	17	8.5	26	13.0			13.7	13.6
School subjects	2	8.7	1	4.3	5	21.7	2	8.7	1	4.3	1	4.3	1	4.3			8.0	7.9
Sports and Games	19	39.6	5	10.4	1	2.1	3	6.2	3	6.2	3	6.2	6	12.5			11.9	7.3
Places to visit	12	15.8	3	3.9	11	14.5	3	3.9	9	11.8	4	5.3	10	13.2			9.8	7.5
Things in home	5	12.8	3	7.7	2	5.1	3	7.7	3	7.7	1	2.6	2	5.1			7.0	6.0
Self-ratings	11	37.9	2	6.9	3	10.3	1	3.4	4	13.8	1	3.4	10	34.5			15.7	12.1
Competencies	36	25.2	7	4.9	24	16.8	22	15.4	23	16.1	18	12.6	22	15.4			15.2	13.5
Time Diary	4	21.1	1	5.3	2	10.5	3	15.8	1	5.3	2	10.5	2	10.5			11.3	9.7
Life Goals	3	8.6	8	22.9	4	11.4	1	2.9	3	8.6	0		5	14.3			9.8	10.0
Accomplishments	12	14.6	13	15.9	20	24.4	15	18.3	19	23.2	12	14.6	14	17.1			18.3	18.9
Attempted Accomplishments	7	20.6	5	14.7	4	11.8	5	14.7	2	5.9	2	5.9	4	11.8			12.2	10.8
Total items	211		75		154		91		110		66		127					

grades are a different order of accomplishment than the extracurricular achievements, and since the majority of items on the grades scale were keyed negatively, making their interpretation different.

The accomplishments, activities, and competencies were the most efficient item pools in numbers of predictors. Their representation on the scales is high overall, and, unlike the self-ratings, for example, is high on most of the individual scales, indicating some consistency.

Discussion

From the practical prediction point of view, the results of this study are obvious. In the first place, the strategy of taking commitment into account was a failure. The conventional and commitment scales contained almost the same items, and the commitment scales predicted no better, whether they were applied to all subjects or only to committed subjects. The two sets of scales are basically interchangeable, and it is the conventional scales which are the subject of the rest of this report.

The validity coefficients of the scales are not high. Although some of them better the multiple correlation coefficients reported by Holland and Nichols (1964), some are lower, and it might have been hoped that item analyses would yield better results than the more rational procedures of the earlier NMSC studies. The validity coefficients of the scales shrank considerably upon cross-validation. Evidently the completely empirical selection of items allowed a number of chance relationships to enter the scales.

The validity coefficients reported are point biserial. Biserial coefficients would, of course, be higher, but the point biserial correlation is more realistic and justified in the present situation, and more comparable to the coefficients reported in earlier NMSC studies.

Some factors related to achievement may not be the same in all institutions,

since college environments probably differ in the opportunity and encouragement they offer for various achievements. Scales developed and applied within one institution, then, might have higher predictive validity than those reported here. However, for many purposes prediction for college students in general is precisely what is needed. More broadly, an understanding of the factors related to success whatever the specific environment is important.

With a group highly selected on academic aptitude, even validity coefficients of around .20, as reported here, may be indicative of valuable prediction. Studies of National Merit Finalists have found very small or non-significant relationships between grades and academic aptitude (Holland & Astin, 1962; Holland & Nichols, 1964; Nichols & Holland, 1963).

Practically, the criteria used were independent, although the larger criterion intercorrelations are statistically significant. Holland and Nichols (1964) reported some higher relationships for similar areas of achievement, but their criterion scales included items of lower quality of achievement, and were continuous rather than dichotomous. When separate intercorrelations were computed for what were called "rare achievements" the values were more comparable to the present results. Much the same observations and conclusions pertain to a similar study by Nichols and Holland (1963).

Inasmuch as grades are often used as the sole criterion for judging students, the lack of relationship between grades and the other achievements is especially noteworthy. Only science achievement correlated significantly with grades among males. This relationship did not emerge consistently in earlier NMSC studies.

The findings on discriminant validity support the characterization of the criteria as independent. In the cross-validation sample, in only one instance was a criterion predicted better by an "outside" scale than by its

intended scale: the speech scale correlated .21 with writing achievement, while the writing scale validity coefficient was .15. The speech scale also correlated nearly as high with leadership achievement (.14) as the leadership scale did (.15). It appears that some combining of criteria may be practical.

Accomplishments, activities, and competencies were the most efficient item pools: a higher proportion of them showed predictive relationships with the criteria. Although it is not quantitatively demonstrated, taking the size of the item relationships into account does not change this conclusion. Holland and Astin (1962) specifically concluded that the best single predictor they tried was high school achievement in areas similar to the college criteria.

The results can be considered substantively, apart from the viewpoint of practical prediction. The content of the scales, and the patterns of correlation among variables, might offer some clues for the understanding of college achievements and the characteristics of achievers. Several cautions, many of which also apply to conclusions presented earlier in this report, are necessary: (a) The scales were constructed with all male samples. (b) The first year of college may not be typical. (c) The response frequencies of some items in the scales were very low; although these items were predictors, they do not characterize many members of a group. (d) The rate of achievement in some areas was low. The resulting small size of the item analysis groups may have contributed to the large shrinkage on cross-validation by allowing unreliable items to be included in the scales. (e) Only statistically significant items are included. Areas of content which differentiated achievers from nonachievers with consistent results from diverse items would be overlooked if no item reached statistical significance. (f) The fullest interpretations would come from seeing the items which did not predict, as well as

the predictors. (g) The size of the predictive relationships is not presented for individual items. (h) The findings are no better than the item pool: important areas of content could be missing.

In addition, the high aptitude of the sample imposes some risk in generalization to more typical students. However, academically talented students are an important group for study in themselves.

The majority of items in the scale to predict grades were endorsed by fewer high grade achievers than low grade achievers. From the content of these negative predictors, it appears that college freshman "A" students had fewer interests, were less active, less social, and less competent in a number of practical, everyday affairs than were "C" students. They did not have fewer accomplishments (few, if any, of the negative predictors represent real achievement), but they did not have more. In short, some of the popular unfavorable stereotypes of high grade achievers are supported.

The nonacademic scales are almost entirely made up of positive predictors: more of the achieving subjects endorsed the items, expressing interest, activity, or competence, than did the nonachievers. Many of the items in each scale were directly content-related to the area of criterion achievement, and a fair number were related to other specific areas of activity and achievement.

It may be that nonacademic achievers are more active generally, with an additional past record of achievement in a specific area which indicates the direction of likely future achievement. If so, it is not surprising that the nonacademic scales intercorrelated positively, to an extent well beyond the item overlap, since there would be some general level of activity and achievement in all these scales (in each item analysis, the great majority of nonachieving subjects did not achieve in any area). Further, the negative correlations between the nonacademic scales and the grades scale would be expected.

If active people tend to nonacademic achievement, and inactive people to academic achievement, the nonacademic criteria should correlate negatively with grades, and positively with one another. The obtained correlations are very near zero, but four of the seven which are negative in sign involve grades. The other three involve science, which, rationally, may be more like grades than the other accomplishments: most science activities are probably directly related to classroom experience and learning, especially when laboratories are used. The largest criterion intercorrelation is between science achievement and grades, .13.

If the above accounting of the nature of the achievements is correct, the grades scale should be a negative predictor of nonacademic achievement, and the nonacademic scales should predict grades negatively. This expectation is not clearly confirmed, but in the item analysis sample (which is the best for this comparison: N is larger, and the scales are not being applied to the same data or areas of achievement on which they were developed) three correlations of the grades scale with other criteria are negative in sign, and four correlations of the other scales with grades are negative. The only remaining negative correlation involves science achievement. In contract, the relationships between the nonacademic criteria and the inappropriate nonacademic scales tend to be low positive.

The interpretation presented can not be regarded as established, especially as it makes use of nonsignificant correlation coefficients. Other hypotheses are possible. However, the interpretation does fit the general pattern of results (nonsignificant results were not considered in isolation).

It does seem that some negative stereotypes of high grade achievers are supported. Past studies have found grades related to conformity and femininity, a lack of dominance and social presence, passivity and timidity, a lack of potential for originality, and self-control (Holland, 1959, 1960;

Holland & Astin, 1962; Nichols & Holland, 1963). (The findings concerning dominance, social presence, and leadership are not entirely consistent.) Nichols (1965) found, with an item analysis, that high grade achievers were characterized by fewer interests, seemed less active, and were more conforming.

The picture of the high grade achiever which has been drawn in this report is not an altogether happy one. Whether the situation warrants change, to what extent change is possible, and how change might be accomplished, are questions which deserve further consideration.

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